

REMARKS/ARGUMENTS

Claim 1

Claim 1 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Murray et al. (U.S. 2004/0051048, hereinafter “Murray”) in view of Hurst et al. (U.S. 4,471,223, hereinafter “Hurst”). This rejection is respectfully traversed.

Murray discloses a system for detecting neutron radiation using a liquid scintillation material. As stated in paragraph 2, there are only two terrestrial sources of neutrons: (1) particle accelerators; and (2) fissile materials. Fissile materials form a threat if used by a terrorist to construct either a nuclear weapon or “dirty bomb.” Accordingly, Murray does not address constructing a radiation detector for use in combination with a source of gamma or ionizing radiation as a level sensing gauge, as presently specified in amended claim 1. Using a neutron emitting isotope as the source for an industrial level sensing gauge, while possible, would be inappropriate because it is both unnecessarily dangerous and expensive. Accordingly, a person of ordinary skill in the art would not be led by the highly schematic disclosure of Murray to modify it for such use. Instead, to construct such a highly modified apparatus could only be guided by hindsight use of the presently-claimed invention as a road map.

The Murray device discloses that the liquid scintillation material 108 may be in a long tube 102 “made from a Teflon® derivative, Teflon® AF (Amorphous Fluoropolymer).” See Murray, paragraphs 0015 and 0021, as well as claims 3 and 4 which expressly claim Teflon® material. As stated in the enclosed Declaration of Charles E. Baldwin, ordinary Teflon® or its derivatives are not useful for the flexible tubing of the present invention. The flexible tube must be made of either TYGON®, CHEMFLUOR®, or a substantially equivalent material having

substantially equivalent properties. The preferred material is CHEMFLUOR® 367. See paragraph 0020 of the application. Applicants are not aware of any other equivalent materials available on the market today, though it may be possible that a substantially equivalent material may be invented or become available in the future.

Claim 1 has been specifically limited to use with a source of gamma or ionizing radiation, which excludes a neutron emitter as taught by Murray. Additionally, claim 1 has been amended to specify that the flexible tube is made from TYGON® or CHEMFLUOR®. These limitations are not taught by the prior art. Moreover, although the Examiner points out that Hurst discloses the use of scintillating optical fibers, such fibers are not the subject of the present invention nor is such structure claimed. Accordingly, claim 1 is patentably distinct over the cited prior art.

Claims 2 and 7

Claims 2 and 7, which depend from Claim 1, stand rejected under 35 U.S.C. 103(a) as being obvious over the combination of Murray et al. and Hurst et al. in view of Wojcik et al. (U.S. 5,856,946, hereinafter “Wojcik”). This rejection is respectfully traversed.

The Examiner acknowledges that Murray (as well as Hurst) lacks an expansion chamber for accommodating volumetric expansion of the liquid scintillation material. Wojcik discloses a liquid-core light guide designed to accommodate temperature-induced volumetric variations. As discussed above, a combination of Murray and Hurst does not teach or suggest the presently-claimed combination. The addition of Wojcik does not cure these defects.

Nothing in Wojcik provides a motivation for combining parts of any of these three references together. Additionally, if such a combination were created, the logical result would be to substitute the liquid-core light guide of Wojcik for the optical fiber light guide 6 of Hurst. Such a combination would be functional, but would not include the neutron detection liquid

scintillation material of Murray. Substituting the neutron detection liquid scintillation material of Murray into this combination would require the further modification of choosing a liquid scintillation material effective with gamma or ionizing radiation and the replacement of the Teflon® tube of Murray for one made of TYGON or CHEMFLUOR, as claimed. Likewise, there is no motivation provided by the prior art to insert a light guide extension, either of fiber optics or liquid core, into the Murray device in order to space the neutron detection scintillator from its electronic detector components. To the extent that Wojcik discloses the use of a flexible outer sheath (column 4, lines 55-61, and column 6, lines 60-62), it is to provide a flexible bladder 20 as a volumetric expansion chamber covering only a short portion of the light guide. Such a construction would be incompatible with the protective sheath 7 disclosed by Hurst. None of the structures disclosed in Wojcik include a movable wall *within* the variable volume expansion chamber as specified in Claim 7.

For these reasons, Claims 2 and 7 are patentably distinct over the prior art.

Claim 6

Claim 6 stands rejected under 35 U.S.C. §103(a) as being obvious over the combination of Murray et al., Hurst et al., and Wojcik et al., in view of Nath (U.S. 3,995,934). This rejection is respectfully traversed.

Nath discloses a flexible liquid filled light guide having an external liquid supply container (6, 43). Wojcik and Nath appear to disclose mutually exclusive alternatives for compensating for volumetric variations in a liquid filled light guide. The light guide of Hurst is not liquid filled but is optical fibers, for which the inventions of Wojcik and Nath would be of no use. Although there is no motivation to substitute a liquid filled light guide for the optical fibers disclosed in Hurst, either as a light piper or as scintillating optical fibers, doing so would not

result in a device having a liquid filled scintillator for use as a radiation-type level gauge using a source of gamma or ionizing radiation, as presently claimed. Forcing the structures of Wojcik and/or Nath into the structure of Murray would only create a neutron detector in which a liquid-filled light guide separated the scintillator from the electronic components. As discussed above, there would be no purpose for modifying Murray in this way for its disclosed use as a neutron detector for sensing the presence of terroristic materials.

Alternatively, forcing the apparently mutually exclusive structures of Wojcik and Nath into Hurst would simply result in the substitution of a liquid filled light guide for the optical fibers shown in Hurst. If this combination were modified by the teachings of Murray the result would be either 1) a detector for the presence of terrorists' fissile materials in which the neutron-detecting scintillator is remotely positioned from the electronics component or 2) a useless radiation-type level detection gauge in which dangerous neutron emitting fissile material would have to be substituted for the gamma radiation source 4 shown in Hurst. Moreover, to substitute scintillating plastic optical fibers for the sodium iodide crystals, as mentioned in Hurst, would not achieve the presently-claimed invention combination (which does not include any form of scintillating optical fibers).

In any event, even though nothing in the prior art suggests forcing together such a combination, the resultant combined structure would not teach or suggest the presently-claimed combination. Accordingly, Claim 6 is patentably distinct over the prior art.

Claims 10 and 11

Claims 10 and 11 stand rejected under 35 U.S.C. §103(a) as being obvious over Murray et al. and Hurst et al. in view of Majewski et al. (hereinafter "Majewski"). This rejection is respectfully traversed.

Majewski discloses that, in a laboratory setting, small samples (one cm³) of the liquids being tested were poured into small quartz cuvettes (which are inherently non-flexible) “which were then wrapped with Teflon tape (except their bottom windows) to optimize light collection.” Majewski makes no mention of the light reflective qualities of Teflon tape nor even its color. “Optimizing light collection,” as described, could be achieved by the disclosed Teflon tape being merely opaque to exclude outside light rather than to reflect light internally. Accordingly, it does not include any suggestion to situate a light reflector (whether a flexible sheet, as specified in Claim 11, or otherwise) around a liquid-filled scintillation chamber made of TYGON or CHEMFLUOR within a protective sheath as part of a flexible scintillator used as a level sensing gauge in combination with a source of gamma or ionizing radiation that may or may not be remotely spaced from the electronic components thereof by an optical fiber or liquid filled light pipe.

Again, the prior art does not suggest making such a combination and, if done, the resulting structure would require hindsight modifications prompted only by the present specification. Accordingly, Claims 10 and 11 are patentably distinct over the prior art.

Claim 12

Claim 12 is rejected under 35 U.S.C. §103(a) as being obvious over the combination of Murray et al. and Hurst et al. in view of Rozsa (U.S. 6,407,390). This rejection is respectfully traversed.

Rozsa discloses circuitry for compensating for the temperature-induced performance shift of a sodium iodide (NaI) scintillation crystal and a photomultiplier tube in industrial settings. While the Rozsa invention may very well be applicable to a structure like that shown in Hurst, there is no suggestion that it would be similarly applicable to the structure disclosed in Murray.

Moreover, nothing in Rozsa overcomes the lack of motivation in the prior art to combine any parts of Hurst with any parts of Murray nor does it overcome the functional flaws that would be found in such a combination. Additionally, it does not supply the missing disclosure to use TYGON or CHEMFLUOR to construct the flexible tubing that holds the claimed gamma or ionizing radiation reactive scintillating liquid. Accordingly, Claim12 is patentably distinct over the prior art.

Claims 3-5, 8, and 9

The Examiner has indicated claims 3-5, 8, and 9 to be allowable if rewritten in independent form. Claims 3, 8, and 9 have been so amended. Claims 4 and 5 depend from independent claim 3. Thus, these claims are now in immediately allowable form.

New Claims 14 and 15

New claims 14 and 15, directly and indirectly dependant from claim 1, are presented. Support for these claims in the specification is described in the enclosed Declaration of Charles E. Baldwin.

Claim 14 specifies that the detector is used as a level sensing gauge in combination with a source of gamma or ionizing radiation, that the flexible tube is constructed of TYGON or CHEMFLUOR, and that the protective sheath has sufficient circumferential rigidity and an inside diameter sized sufficiently close to an outside diameter of the flexible tube to prevent kinking of the flexible tube when both are bent together. As set forth in the above-referenced Declaration, the disclosed spiral-wound, metallic conduit is crush resistant, which gives it circumferential rigidity. The inside diameter of the sheath may be relatively close to the outside diameter of the flexible tube, as shown in Fig. 4, for example. This combination can be important because kinking of the flexible tube will severely degrade the detector's performance.

The use of such an armored sheath having circumferential rigidity is not taught by the prior art. The scintillating optical fibers suggested by Hurst (and not a part of the present invention) do not have a risk of collapse or kinking, as does the presently claimed liquid filled flexible tube. Additionally, the prior art does not teach the inclusion of a flexible sheet of material substantially surrounding sidewalls of the flexible tube to provide protection from abrasion between the sheath and tube when the detector is bent, as set forth in claim 15. Accordingly, claims 14 and 15 specify patentably distinct combinations .

Conclusion

The prior art does not suggest the use of a liquid filled scintillator for use with a source of gamma or ionizing radiation in a flexible tube of TYGON or CHEMFLUOR within a flexible protective sheath joined with photodetection circuitry for use as a level sensing gauge. Although the present inventors find that using a neutron emitter as a source of radiation for a level sensing gauge would not be feasible, gamma or ionizing radiation source has been specifically claimed. Therefore, a person of ordinary skill in the art would not be motivated to use the liquid filled fissile material detector of Murray as such nor to substitute TYGON or CHEMFLUOR for the Teflon® tube taught and claimed by Murray. The use of plastic scintillation optical fibers, suggested by Hurst and not a part of the present invention, does not supply the missing suggestions. None of the other prior art of record suggest the extensive modifications and substitutions that would be required to meet the terms of the claims.

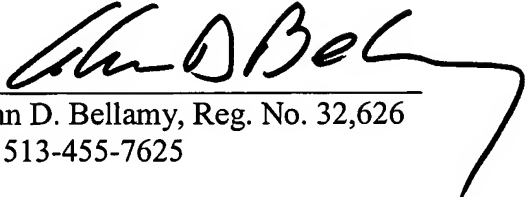
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Favorable reconsideration and prompt allowance of all the claims 1-12, 14, and 15, are respectfully requested.

Respectfully submitted,
Charles E. Baldwin et al.

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